United States Patent [19]

McCullough, Jr. et al.

[11] **Patent Number: 4,865,931**

[45] **Date of Patent: Sep. 12, 1989**

[54] **SECONDARY ELECTRICAL ENERGY STORAGE DEVICE AND ELECTRODE THEREFOR**

[75] Inventors: **Francis P. McCullough, Jr.; Alvin F. Beale, Jr.**, both of Lake Jackson, Tex.

[73] Assignee: **The Dow Chemical Company**, Midland, Mich.

[21] Appl. No.: **678,186**

[22] Filed: **Dec. 4, 1984**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 558,239, Dec. 5, 1983, abandoned.

[51] **Int. Cl.**[4] **H01M 4/58**

[52] **U.S. Cl.** **429/194**; 429/218; 423/447.2

[58] **Field of Search** 429/194, 218; 423/447.2

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,844,837	10/1974	Bennion et al.	429/199 X
4,005,183	1/1977	Singer	423/447.2
4,285,831	8/1981	Yoshida et al.	423/447.2 X
4,423,125	12/1983	Basu	429/218 X

Primary Examiner—Stephen J. Kalafut

Attorney, Agent, or Firm—John Lezdey

[57] **ABSTRACT**

An electrode suitable for use in energy storage devices is described which is made of an assembly of an electrically conductive carbonaceous material having conjugated and preferably polybenzenoid plate-like structures. The carbonaceous material has a Youngs modulus of greater than 1,000,000 psi. The so-defined electrode material does not undergo a substantial change in dimension during repeated electrical charge and discharge cycles. Additionally there is described an energy storage device utilizing the above described electrode.

10 Claims, 3 Drawing Sheets